Lessons Learned in Internet2 Conferencing

Jay Beavers

Research Developer

Microsoft Research, Learning Sciences & Technologies

What are we doing?

- Learning Sciences & Technologies
  - Distributed Classroom (DISC)
    - High quality, low latency conferencing
    - Interaction (DPPT, whiteboard, feedback, etc.)
    - Low Total Cost of Ownership
- Collaboration & Multimedia
  - Ring Cameras
  - Automated Camera Management

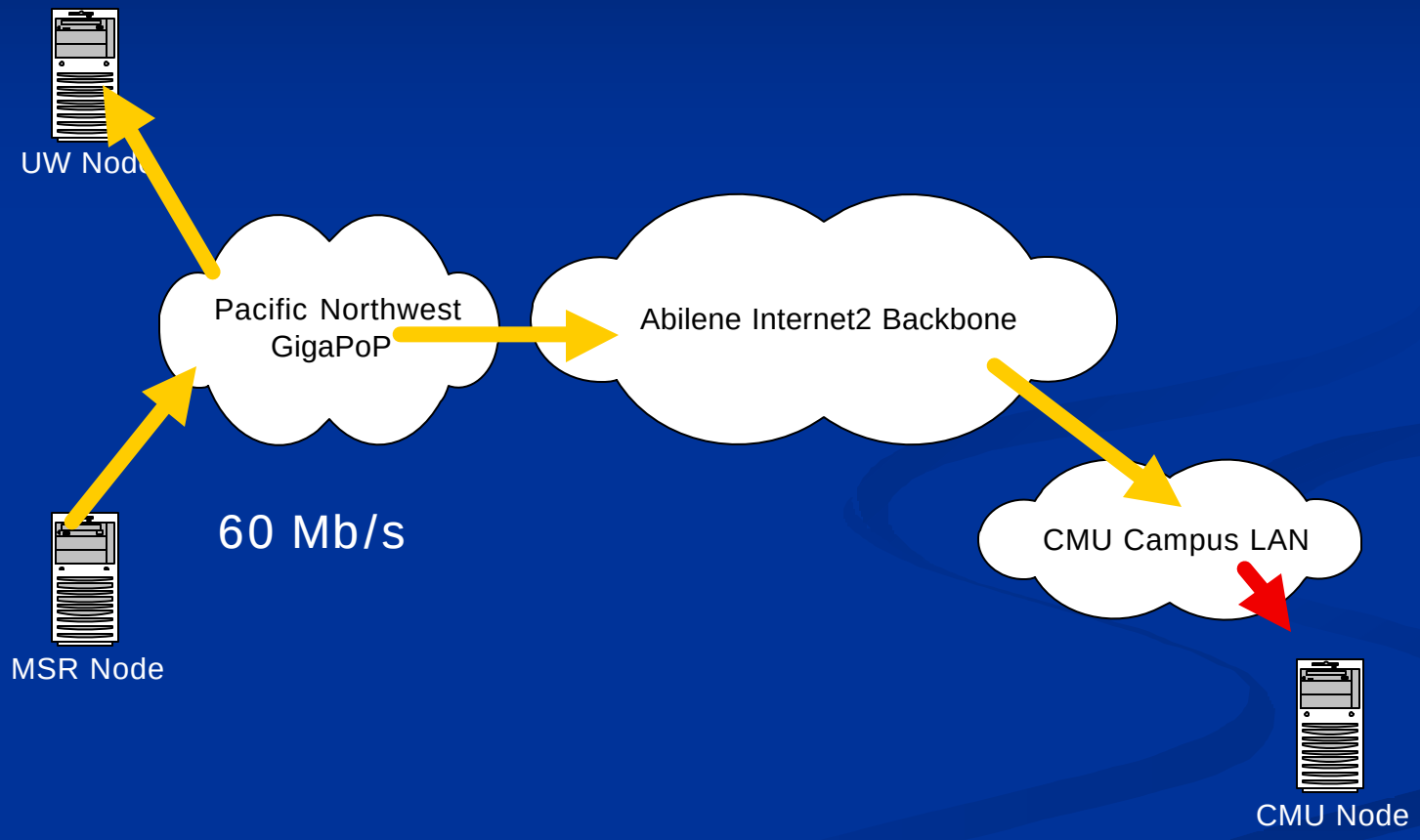
Lesson 1: Configuration Details

- Video chipsets
- Capture devices
- Drivers

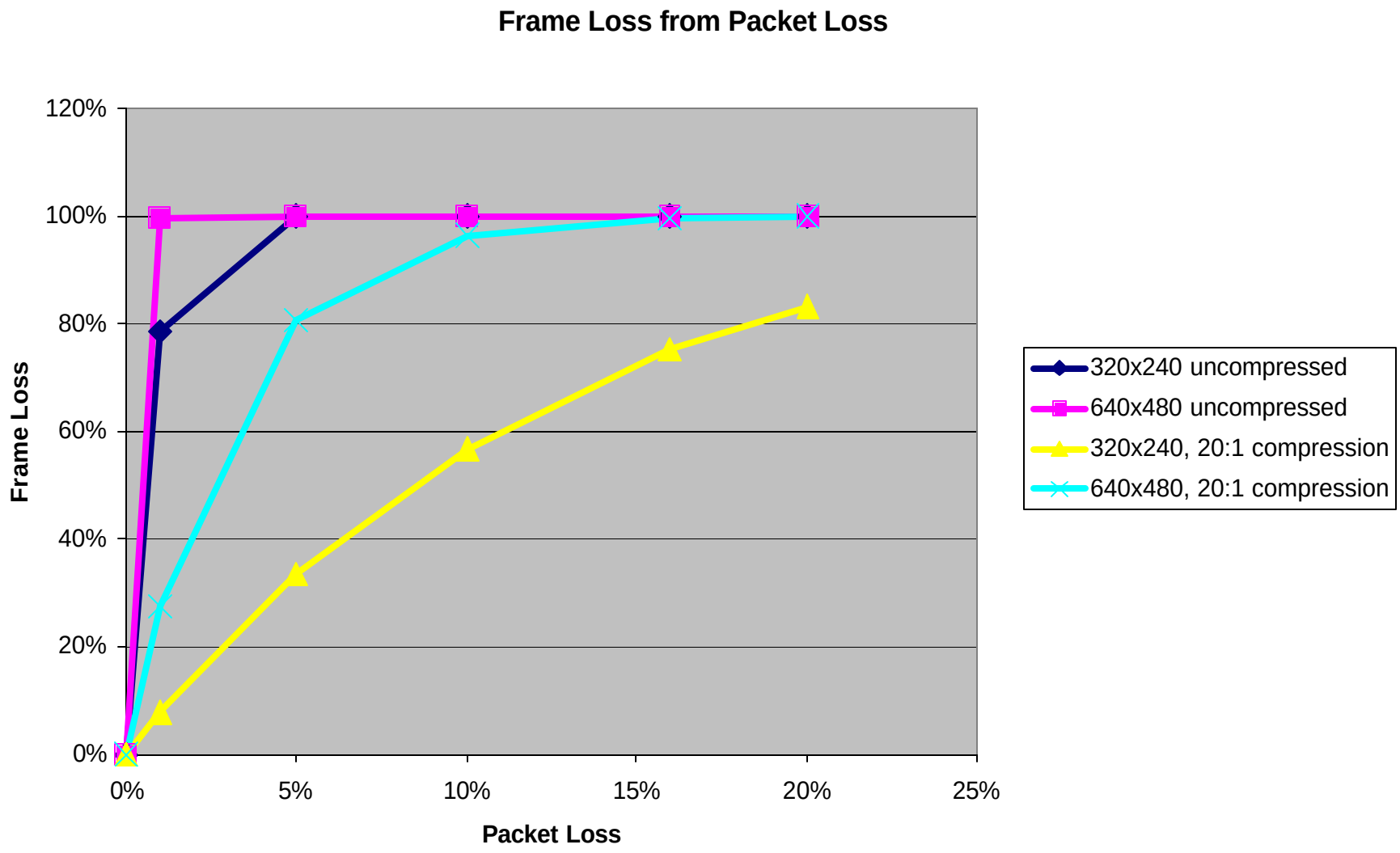
The first attempt

- Controlled System Configuration
- The Internet2 is Limitless!
  - Multicast enabled
  - Infinite bandwidth
  - Low latency
  - No collisions or packet loss
- 90% of the system already exists in DirectShow!
  - Implement multicast Real Time Protocol (RFC 1889)
  - Simple client UI

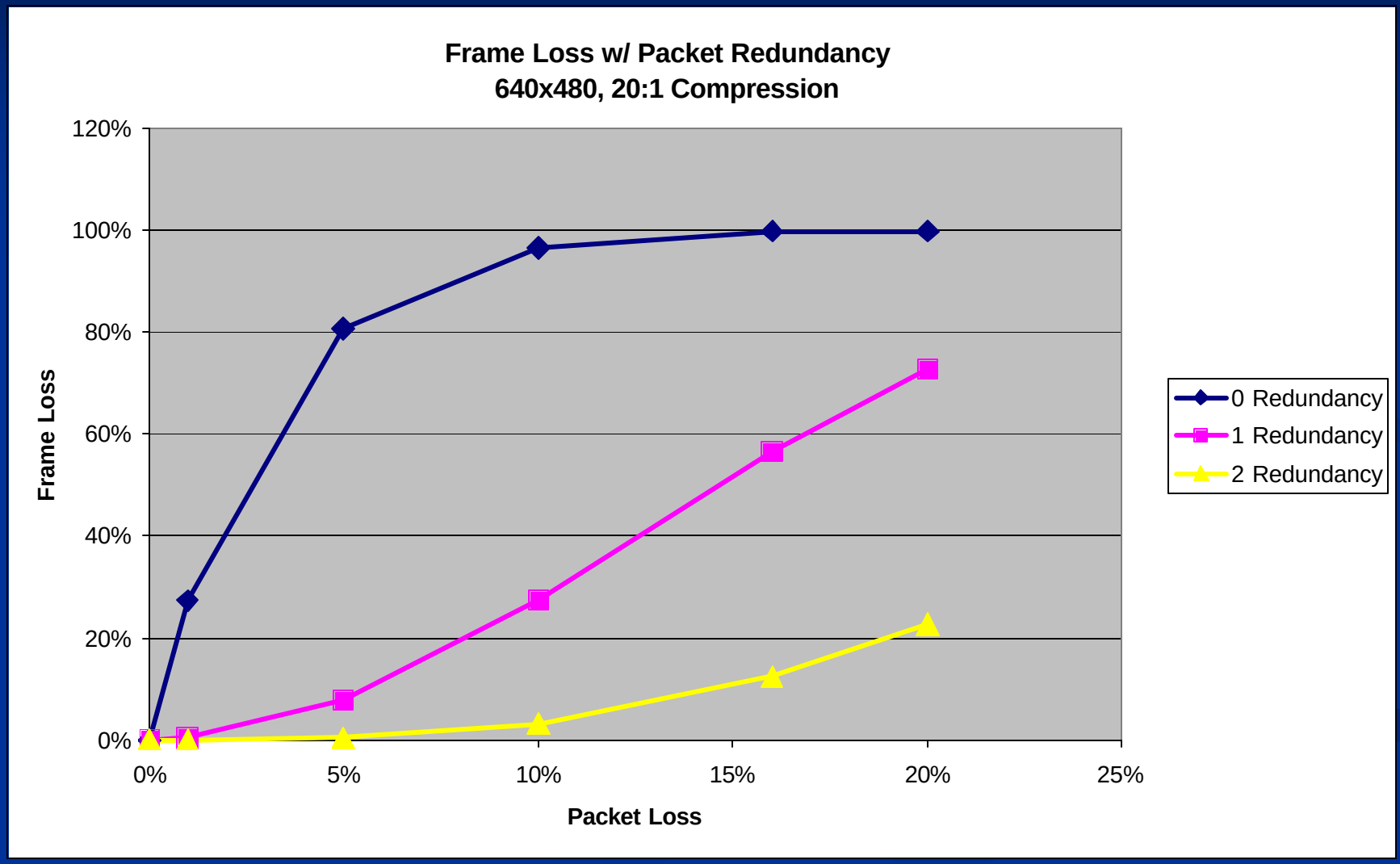
Lesson 2: Point to Point != Internet2



Lesson 3: Packet Loss



Packet Redundancy



The second attempt

- 20:1 compress the video
- Add 1x Packet Redundancy
- Better, but still not usable
  - Signal freezes frequently in the middle of conversation
  - Unexpected, unexplained, catastrophic loss of signal

Lesson 4: Multicast Network Diagnostic Tools Suck

- Tracert & IPerf: low latency, high throughput
- Multicast Beacon: green 99% packet reception

- Reality: Every 180 seconds, 5-35 seconds of data goes bye-bye

- Serious work with MPING to confirm behavior conferencing apps
- Big disjoint between router and computer diagnostics

Third Try is the Charm?

- ‘Pipecleaner’ diagnostic utility
  - Runs as a Service
  - Web Interface
  - Combines features from other diagnostics with performance history database & graphing
  - May add IGMP router queries
- Testing intelligent error correction
- Testing additional codecs

Lessons Summary

1. Small configuration details matter greatly to A/V
2. Internet2 doesn't go point to point, plan for LANs
3. Packet loss happens, deal with it
4. We need better diagnostic tools

Futures

- First publicly available tools ~ December 2001
- First DISC deployment Spring 2002
- Extended DISC deployment Fall 2002

- Working with ANL on Access Grid compatibility
- RFP for collaborative technologies

http://Portal.LearningWebServices.Com/DISC

JBeavers@Microsoft.Com